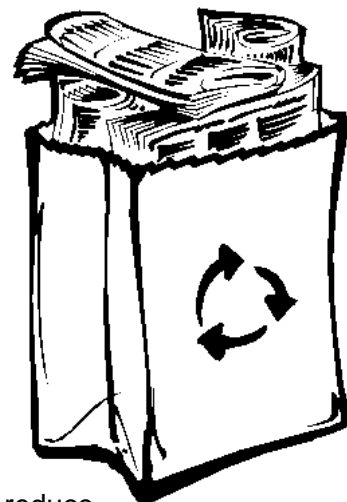


## Activity 10

# Pollution Prevention



Duration	2 class periods
Grade Level	7-12
Key Terms/ Concepts	Corrosive Hazardous waste Ignitable Pollution prevention Reactive Solid waste Toxic
Suggested Subjects	Chemistry Civics/Government Mathematics Physical Science Social Studies

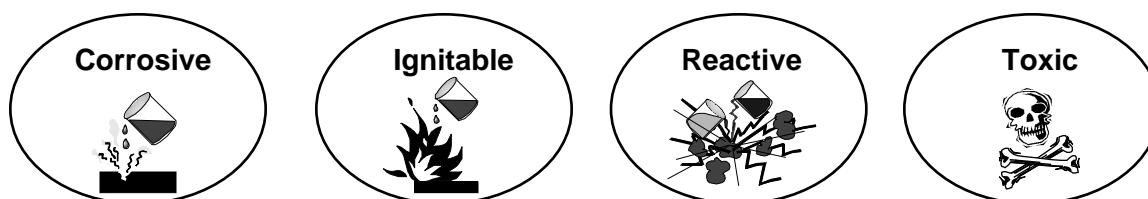
## Purpose

This activity helps students understand what can be done to reduce the amount of solid and hazardous wastes that must be disposed of. Students review the characteristics of hazardous waste and develop an estimate of the amount of household hazardous waste in their community.

## Background

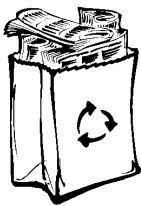
**Pollution prevention** is any effort to reduce or eliminate pollution and wastes. Efforts can include reducing the release of pollutants to the air, reducing runoff into streams, preventing releases of hazardous chemicals, and decreasing the volume of **solid** and **hazardous wastes** we produce. This activity focuses on preventing pollution by reducing solid and hazardous wastes.

Hazardous waste is defined as any material that presents a threat or unreasonable risk of injury to people or the environment when it is produced, transported, used, or disposed of. Hazardous waste is categorized into four groups based on its characteristics:



By far the most hazardous waste is produced by industries and manufacturing. We also produce some hazardous waste in our homes when we do not properly dispose of items like worn-out batteries, paint products, cleaning agents, used motor oil, pesticides, and fertilizers.

*NOTE: Even though industrial processes generate most hazardous waste, this activity focuses on hazardous materials found in homes because students can collect information on these materials more readily. Ideas for activities that focus on pollution prevention efforts in industry are included in the Extensions listed at the end of this lesson.*



*Warm-Up 1: Defining Hazardous Waste* is good preparation for this activity. For more information on pollution prevention, see the Suggested Reading list found at the end of the Haz-Ed materials.

## Preparation

1. Gather the following materials:
  - Copies for each student of *Fact Flash 7: Pollution Prevention*
  - Copies for each student of the Student Worksheet, *Hazardous Substance Data Collection Form*
  - Copies for each student of the Student Handout, *Chemicals in the Household*.
2. Read Fact Flashes 1 and 7 to prepare your lecture.
3. Distribute Fact Flash 7 and have students read it for homework.

## Procedure

### Class #1

1. Discuss pollution prevention in class using the contents of *Fact Flash 7: Pollution Prevention*.
2. Review with students the definition and categories of hazardous waste. Ask the students for examples of products in their homes that fall within each of the 4 hazardous waste categories.
3. Distribute the Student Worksheet, *Hazardous Substance Data Collection Form*.
4. Give students a homework assignment to identify all of the hazardous materials found in their homes and record the following information on the Student Worksheet:
  - The name of the product
  - The use of the product
  - Hazardous waste category of the substance (toxic, reactive, ignitable, corrosive—read label for information)
  - Estimated volume of the material remaining in the container.

*Note: Have students tell their parents about the assignment before they start the activity. Caution them not to touch any of the substances or open the containers.*



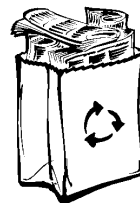
## Class #2

1. Ask the students what kinds of hazardous substances they found in their homes.
2. On the chalkboard, compile a list of products in each category found in the students' homes.
3. Explain to the students that their homes will be used as a sample of the homes in the community, and that the sample will be used to estimate the total amount of hazardous substances in all the homes of the community.
4. Have students calculate the number of gallons (or liters) of each category of hazardous substances they have reported in their homes (1 fluid ounce equals 30 milliliters, 0.26 gallons equals 1 liter).
5. Calculate a class-wide average of the amount of hazardous substances in each category.
6. Estimate the number of households in the community, using population information and assuming an average of 3.5 persons per household.
7. Have students multiply the class-wide average of hazardous substances in their homes by the number of homes in the community to estimate the total amount of hazardous substances in all of the homes of the community.
8. Discuss how much of each of these products might become hazardous waste—for example, by being thrown away in the trash or poured down drains that empty into the public water system. Discuss where these waste products end up.
9. Ask the students for ideas on what they personally can do to reduce the amount of hazardous waste. Ask them to name some alternative products that do the same jobs as products containing hazardous substances (for example, baking soda is an alternative to using commercial oven cleaners).
10. Distribute the Student Handout, *Chemicals in the Household*. Have students discuss the feasibility of changing people's habits and convincing them to use the alternatives on the list.



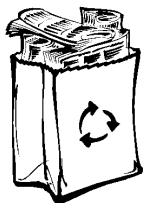
## Extensions (Optional)

- Assign a group of students to identify the types and amounts of hazardous waste present in your school. Use the Student Worksheet to record the information they collect. Have them present their findings to the class and encourage the class to discuss ways in which the school could reduce its use of hazardous substances. Consider presenting these ideas to the school principal and the PTA.
- Have students contact the local health or environmental services department to investigate how much industrial garbage is collected and disposed of each year and what the community government is doing to deal with the potential hazardous waste problems this creates.
- Have students contact the local chamber of commerce, the county health department, or the local or state government environmental agency to obtain the names of local manufacturers and other businesses that have active pollution prevention programs. Have students interview officials at these companies about what they are doing to reduce waste and prevent pollution. As an alternative, invite local manufacturers and business owners to come to the class to discuss their pollution prevention programs. Local businesses that are working to reduce their wastes most likely would be quite happy to cooperate.
- Plan a field trip to a local **recycling** center or hazardous waste collection center. Check with the local chamber of commerce, or local or state government environmental agency to see if there is a household hazardous waste collection program in your area. More information on hazardous waste collection programs can be obtained by calling the RCRA/UST, Superfund, and EPCRA Hotline in Washington, DC, which is open Monday through Friday, 9:00 a.m. to 6:00 p.m. Eastern Standard Time. The national toll free number is 800-424-9346; for the hearing impaired it is TDD 800-553-7672.
- Consider showing a videotape describing pollution prevention. Check with your school or local librarian and with local public television stations for educational videotapes describing municipal, household, or hazardous waste management. For example the League of Women Voters of California's Education Fund produced two award-winning videotapes in 1990. *Cleaning Up Toxics at Home* and *Cleaning Up Toxics in Business* outline ways in which citizens and small businesses can significantly reduce pollution. Each tape is available for \$29.95 (\$49.95 for both) and may be ordered by calling The Video Project at 1-800-4-PLANET. Another video, called *The Rotten Truth*, was produced by the Children's Television Workshop for its 3-2-1 *Contact* program. The video is available for \$14.98, plus shipping and handling, by calling the distributor, Sony Wonder, at 1-800-327-3494.



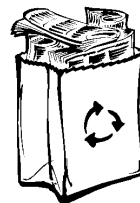
# Hazardous Substance Data Collection Form

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## Hazardous Substance Data Collection Form

Product Name	Product Use	Hazardous Waste Category (toxic, reactive, ignitable, corrosive)	Estimated Volume Remaining



## Chemicals in the Household

CHEMICAL PRODUCTS	HAZARDOUS INGREDIENTS	POSSIBLE ALTERNATIVES AND HINTS
Toilet Cleaners	Muriatic (hydrochloric) acid Oxalic acid Paradichlorobenzene Calcium hypochlorite	Toilet brush and baking soda; Mild detergent; Vinegar soak for tub and sink fixtures; Avoid direct skin contact and breathing of fumes.
Drain Cleaners	Sodium or potassium hydroxide Sodium hypochloride Hydrochloric acid Petroleum distillates	Plunger; Flush drain with 1/4 cup baking soda and vinegar; Avoid direct skin contact and breathing of fumes.
Oven Cleaners	Potassium or sodium hydroxide Ammonia	Baking soda and water; Avoid direct skin contact and breathing of fumes.
Bleach Cleaners	Sodium or potassium hydroxide Hydrogen peroxide Sodium or calcium hypochlorite	1/2 cup white vinegar or baking soda for laundry; Avoid direct skin contact and breathing of fumes.
Dishwashing detergent	Chlorine Surfactants	1 part borax to 1 part baking soda; Handle <u>all</u> cleaning solutions with care.
Ammonia-based cleaners (all purpose cleaners)	Ammonia Ethanol	Vinegar and salt water mix for surfaces; Baking soda and water.
Glass cleaners	Ammonia Naphthalene	Washing windows with 1/4 to 1/2 cup white vinegar to 1 quart warm water, rub dry with newspaper.
Fabric softener	Ammonia	1 cup white vinegar or 1/4 cup baking soda in final rinse water.
Air fresheners	Cresol Phenol Formaldehyde	Open box of baking soda or dish of vanilla; Simmer cloves; Open windows or use exhaust fans.
Laundry detergent	Surfactants	Avoid breathing powder.
Mothballs	Naphthalene Paradichlorobenzene	Cedar chips; Newspapers; Lavender, flowers, or other aromatic herbs and spices.



## Chemicals in the Household (continued)

CHEMICAL PRODUCTS	HAZARDOUS INGREDIENTS	POSSIBLE ALTERNATIVES AND HINTS
Rug and upholstery cleaners	Naphthalene Perchloroethylene Oxalic acid Diethylene glycol	Baking soda or rug, then vacuum.
Floor and furniture polish	Diethylene glycol Petroleum distillates Nitrobenzene Mineral Spirits	1 part lemon oil, 2 parts olive/vegetable oil; Vegetable oil soap.
Furniture strippers	Acetone Methyl ethyl Ketone Alcohols Xylene Toluene Methylene chloride	Equal portions of boiled linseed oil, turpentine, and vinegar with steel wool; sandpaper or heatgun; Use in well ventilated areas or outdoors; Handle <u>all</u> solvents with care.
Stains/finishes	Mineral spirits Glycol ethers Ketones Halogenated hydrocarbons Naphtha Xylene Toluene	Natural earth pigment finishes; Use in well ventilated areas or outdoors; Handle <u>all</u> dyes and paints with care.
Enamel or oil-based paints	Pigments Aliphatic hydrocarbons	Water-based paints if appropriate; Always use in well ventilated areas.
Latex paint	Mercury	Handle <u>all</u> paints with care.
Antifreeze	Ethylene glycol	Clean up all spills.
Automobile batteries	Sulfuric acid Lead	Bring old batteries to recycling center; Avoid direct skin contact; Wash spills with plenty of water.
Automobile lubricants (transmission and brake fluids, used oils)	Hydrocarbons (benzene) Mineral Oils Glycol ethers Heavy metals	Seal used oil in plastic container and bring to recycling service station.

### Notes

- \* The listed alternatives are offered as options and are not represented as recommended courses of action.
- \* Several listed alternatives are also potentially hazardous and can cause harm if handled improperly.
- \* Various commercial products which fall into the product categories listed here may not contain all of the listed chemical constituents.